

## **REMARKS**

### **Status of the Claims**

Claims 1-28, 38, 39, 43, 56-72, 85 and 86 were pending in the application, with claims 38, 39, 43, 56-72 and 86 being rejected by the Examiner. Claims 1-28 and 86 have been cancelled in response to the earlier issued Restriction Requirement. Claims 38, 39, 43, 56-57, 69-72 and 85 have been amended. Claims 87-96 have been added. Claims 38, 39, 43, 56-72, 85 and 87-96 are pending in the application.

### **Office Action**

Claim 70 stands rejected under 35 USC § 112 as being indefinite.

Claim 38 stands rejected under 35 USC § 102(b) as being anticipated by Laurell (WO 02/072234).

Claims 39, 43, 56-59, 61, 62, 69 and 71-72 stand rejected under 35 USC § 103(a) as being unpatentable over Laurell (WO 02/272234) and in further view of Zumeris (WO 03/027027).

Claims 60 and 63 stand rejected under 35 USC § 103(a) as being unpatentable over Laurell (WO 02/272234) in view of Zumeris (US 7,431,892) and in further view of Yasuda (US 6,216,538). (The Examiner erroneously referred to claims 67 and 68 in the statement of rejection, but actually addressed claims 60 and 63.)

Claims 67 and 68 stand rejected under 35 USC § 103(a) as being unpatentable over Laurell (WO 02/072234) in view of Zumeris (US 7,431,892) and in further view of Cefai (GB 2339703).

Claims 85 and 86 (sic, claim 86 is withdrawn and now cancelled) stand rejected under 35 USC § 103(a) as being unpatentable over Zumeris (US 7,431,892) in view of Cefai (GB 2339703).

### **Section 112 Rejection**

Claim 70 has been amended to correct typographical errors.

**Amended Claim 38 is Patentable over Laurell**

Claim 38 stands rejected under 35 USC § 102(b) as being anticipated by Laurell. Claim 38 has been amended to incorporate the recitations of claim 39, and thus, Applicants address the rejection of this claim, below, with the Examiner's rejection of claim 39.

**Claims 39, 43, 56-59, 61, 62, 69 and 71-72 are Patentable over Laurell and Zumeris (WO)**

Claims 39, 43, 56-59, 61, 62, 69 and 71-72 stand rejected under 35 USC § 103(a) as being unpatentable over Laurell in view of Zumeris (WO). This rejection is respectfully traversed.

Amended claim 38 recites, in part:

“wherein the ultrasonic cavity has a non-uniform configuration.”

As the Examiner recognizes, Laurell fails to disclose that the cross-sectional configuration of the channel is non-uniform. The Examiner improperly relies on Zumeris (WO) to cure this deficiency. In particular, Applicants submit that it is improper to attempt to combine Laurell with Zumeris (WO).

Laurell discloses an ultrasound microchannel separator including an ultrasound source arranged below a fluid channel for developing standing acoustic waves reaching from one side wall to the other, opposite, side wall (i.e., “side-to-side” relative to the direction of energy input from the ultrasound transmitter). (Page 8, lines 11-17.) Laurell places “great importance” on this idea of the “side-to-side” standing acoustic wave within the channel. (Page 8, lines 18-27.)

In order to properly generate this “side-to-side” standing acoustic wave, Laurell expressly discloses that the side walls of the fluid channel must be parallel or substantially parallel to one another:

“The walls of the base stem 810, 820 are essentially perpendicular to the plate and *parallel or near parallel* to each other, *which is important for the establishment of a standing wave across the entire depth and length of the channel ....*” (Page 9, lines 1-4, emphasis supplied.)

“The *requirement* to make the walls of the base stem (810, 820) vertical or near vertical and *parallel or near parallel to each other* is easily fulfilled by ....” (Page 12, lines 31-33, emphasis supplied.)

Thus, Laurell teaches away from using a cross-sectional configuration of the fluid channel that is non-uniform.

In contrast, Zumeris (WO) discloses an apparatus for sterilizing a liquid using a piezoceramic ring as an ultrasonic vibratable element. (Zumeris is not concerned with particle manipulation). Zumeris (WO) uses the piezoceramic ring to surround a volume of liquid and to create focused ultrasonic waves to develop a high pressure region along the middle axis of the piezoceramic ring for sterilizing that portion of the liquid (see, e.g., FIGS. 1C and 5B). Thus, although Zumeris (WO) discloses that container 29 or tube 30 may have varying cross sections, Zumeris (WO) teaches this in the context of a piezoceramic ring that surrounds the liquid to create a high pressure region along the central axis of the piezoceramic ring.

There is no teaching in Laurell that a varying cross-section configuration of the fluid channel would be of benefit. In fact, Laurell teaches the opposite—Laurell teaches that its “side-to-side” standing waves are only formed if the sides of the channel are “parallel or near parallel” to one another. There is no teaching in Zumeris that a non-uniform cross-section of the tube would be of benefit for particle manipulation. Further, there is no teaching in Zumeris that a non-uniform cross-section would work in, or be of benefit to, the apparatus of Laurell.

A person of ordinary skill in the art would not find it obvious to combine the sterilizing piezoceramic ring of Zumeris (WO) (with either a constant or a varying cross-section) with the particle manipulation apparatus of Laurell. Even further, a person of ordinary skill in the art would not consider incorporating the teaching of Zumeris (WO) of a varying cross-section for a piezoceramic ring into the channel of Laurell. Indeed, to vary the cross-section of Laurell's channel would render Laurell inoperative, render it unsuitable for its intended purpose, or at the very least, completely change its mode of operation.

Applicants respectfully request that the Examiner withdraw the rejection of amended claim 38. Claims 39, 43, 56-59, 61, 62, 69 and 71-72 depend from claim 38, either directly or indirectly, and contain additional recitations thereto. Thus, Applicants also respectfully request that the Examiner withdraw the rejections of these claims.

***Claim 69:***

Claim 69 recites, in part:

“a second fluid channel in fluid communication with the first fluid channel at an intersection within the ultrasonic cavity,

“wherein the first fluid channel and the second fluid channel extend substantially parallel each other on opposite sides of a dividing wall between them,” and

“wherein the intersection comprises a passageway through the dividing wall.”

Neither Laurell nor Zumeris disclose fluid channels extending substantially parallel to each other on opposite sides of a dividing wall between them, wherein an intersection between the channels comprises a passageway through the dividing wall.

The Examiner refers to FIG. 25A of Zumeris as allegedly disclosing, among other things, an intersection comprises a passageway through the dividing wall. Applicants disagree. FIG. 25A fails to disclose any intersection between the channels and certainly fails to disclose any passageway through any wall dividing the channels.

Thus, for this additional reason, Laurell in combination with Zumeris fails to render claim 69 unpatentable. Applicants respectfully request that the Examiner withdraw the rejection of claim 69.

**Claims 60 and 63 are Patentable over Laurell, Zumeris (US) and Yasuda**

Claims 60 and 63 stand rejected under 35 USC § 103(a) as being unpatentable over Laurell in view of Zumeris (US) and in further view of Yasuda. This rejection is respectfully traversed.

Claims 60 and 63 depend, indirectly, from claim 38 and contain additional recitations thereto. Yasuda fails to cure the deficiencies of Laurell in view of Zumeris (US) discussed above.

Even further, claim 60 recites, in part:

“wherein the dimension of the ultrasonic cavity in the axial direction of standing wave propagation increases stepwise along the direction of fluid communication through the intersection.”

Claim 63 contains a similar recitation.

Yasuda fails to disclose that “the dimension of the ultrasonic cavity in the axial direction of standing wave propagation increases stepwise along the direction of fluid communication through the intersection.” In FIG. 24 of Yasuda, the stationary waves 87 are all depicted as being the same height. Thus, Yasuda fails to disclose any change in dimension of the ultrasonic cavity in the axial direction of standing wave propagation.

Applicants respectfully submit that claims 60 and 63 are not rendered unpatentable over Laurell in view of Zumeris (US) and in further view of Yasuda. Applicants respectfully request that the Examiner withdraw the rejection of claims 60 and 63.

**Claims 67 and 68 are Patentable over Laurell, Zumeris (US) and Cefai**

Claims 67 and 68 stand rejected under 35 USC §103(a) as being unpatentable over Laurell in view of Zumeris (US) and in further view of Cefai. This rejection is respectfully traversed.

Claims 67 and 68 depend, indirectly, from claim 38 and contain additional recitations thereto. Cefai fails to cure the deficiencies of Laurell in view of Zumeris (US) discussed above. Thus, Applicants respectfully submit that claims 67 and 68 are not rendered unpatentable over Laurell in view of Zumeris (US) and in further view of Cefai.

**Claim 85 is Patentable over Zumeris (US) and Cefai**

Claim 85 stands rejected under 35 USC § 103(a) as being unpatentable over Zumeris in view of Cefai. This rejection is respectfully traversed.

Amended claim 85 recites, in part:

“a second fluid channel in fluid communication with the first fluid channel at an intersection within the ultrasonic cavity”;

“wherein the first fluid channel and the second fluid channel extend substantially parallel each other on opposite sides of a dividing wall between them”; and

“wherein the intersection comprises a passageway through the dividing wall.”

Neither Zumeris nor Cefai disclose fluid channels extending substantially parallel to each other on opposite sides of a dividing wall between them, wherein an intersection between the channels comprises a passageway through the dividing wall.

Thus, Zumeris in combination with Cefai fails to render claim 85 unpatentable. Applicants respectfully request that the Examiner withdraw the rejection of claim 85.

#### New Claims

New claims 87-90, depending from claim 85 and containing additional recitations thereto, have been added. Support for these claims can be found throughout the specification and in the originally filed claims. No new matter has been added.

New independent claim 91 and new claims 92-96, depending from claim 91 and containing additional recitations thereto, have been added. Support for these claims can be found throughout the specification and in the originally filed claims. No new matter has been added.

#### Conclusion

Applicants request that the amendments as outlined above be incorporated into the referenced patent application, and that the application be reconsidered. Applicants submit that all claims pending in the application are now in condition for allowance.

A petition for a three-month extension of time under 37 C.F.R. 1.136(a) and the accompanying fee are filed herewith. The Commissioner is hereby authorized to charge any such fees or credit any overpayment of fees to Deposit Account No. 19-0733.

Respectfully submitted,

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